



Minnesota Pollution Control Agency

MINNESOTA STATEWIDE MERCURY TMDL

Bruce Monson

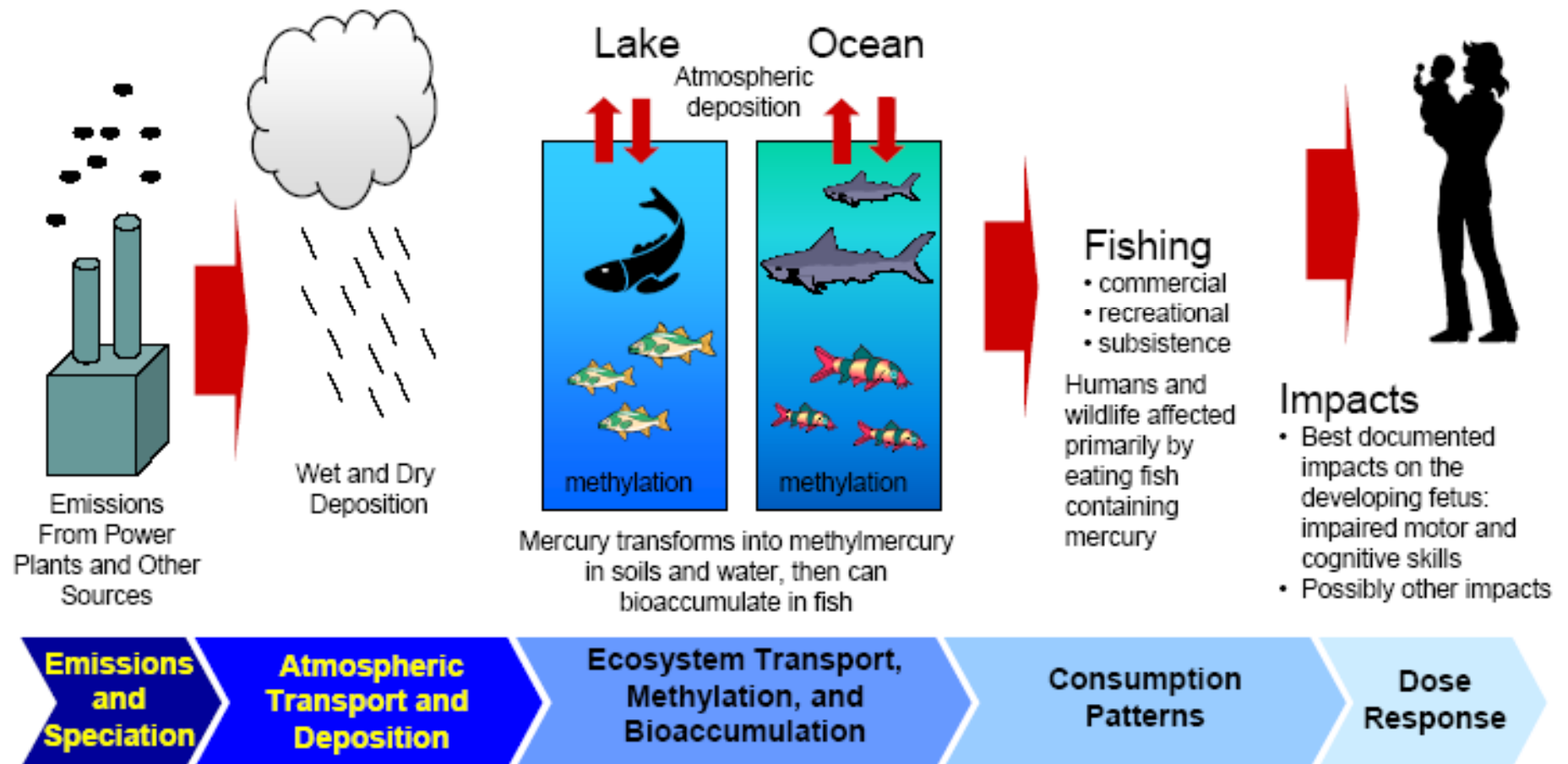
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Overview of Mercury TMDL

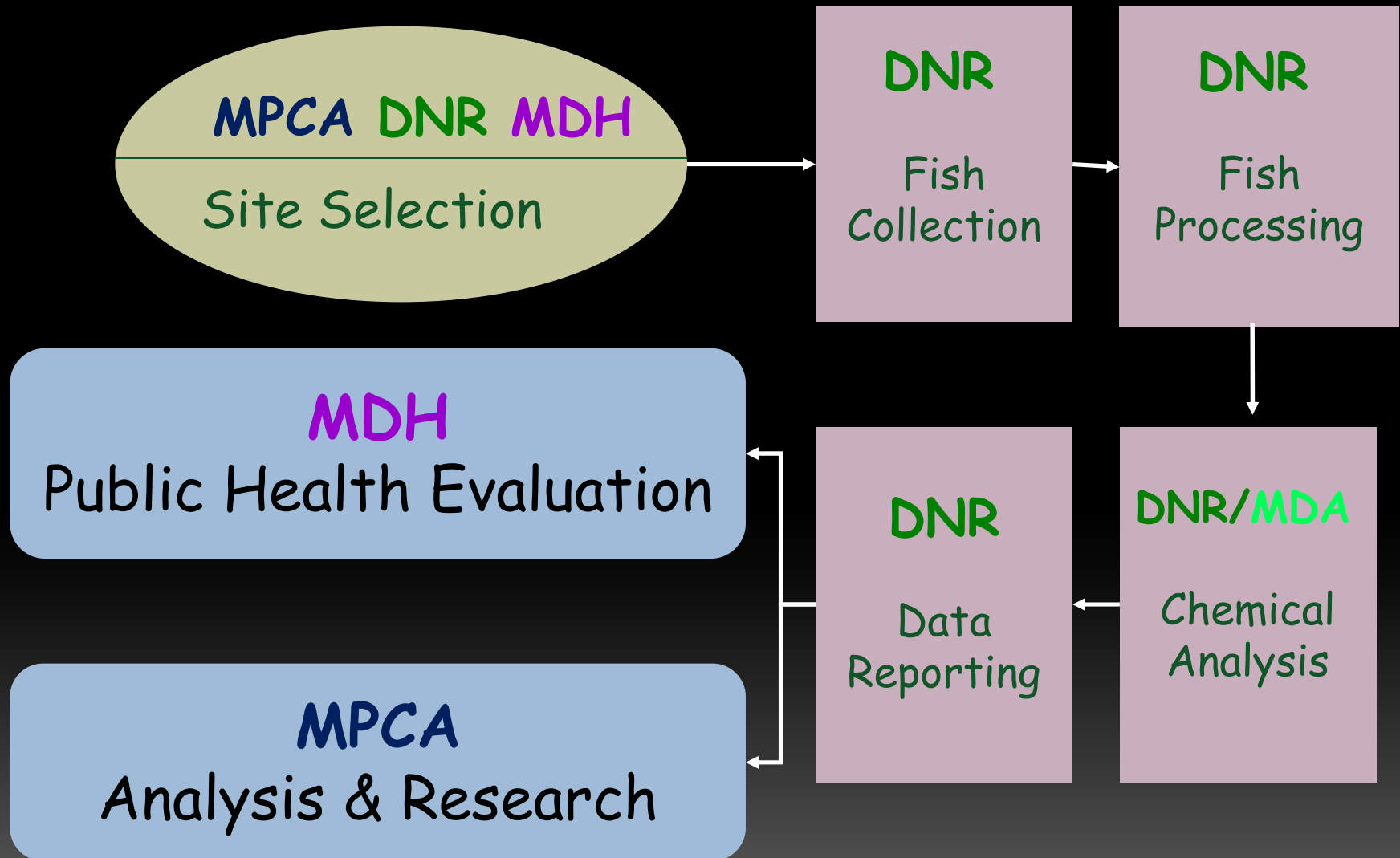
- Begun 2004 after US EPA rejected 4B proposal
- Statewide TMDL = NE and SW Regional TMDLs
- More restrictive NE goal became statewide goal for implementation
- Dominated by mercury air deposition, not discharge
- Goal: 93% reduction in atmospheric deposition of mercury to get 65% reduction in top predator fish
- US EPA approved March 2007

Mercury Exposure Pathway



Source: USEPA, 2004

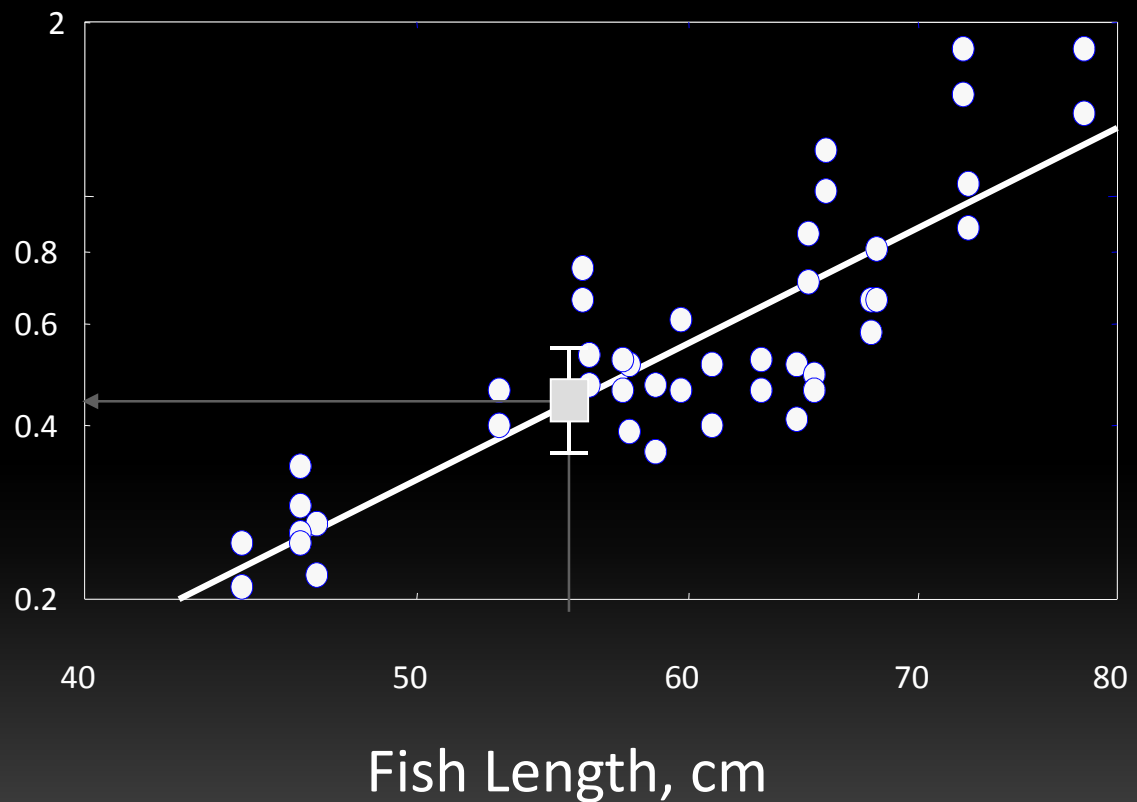
Fish Contaminant Monitoring Process



Calculating Standard Concentration of Northern Pike

Sand Point Lake 69-617 Northern Pike, 1997

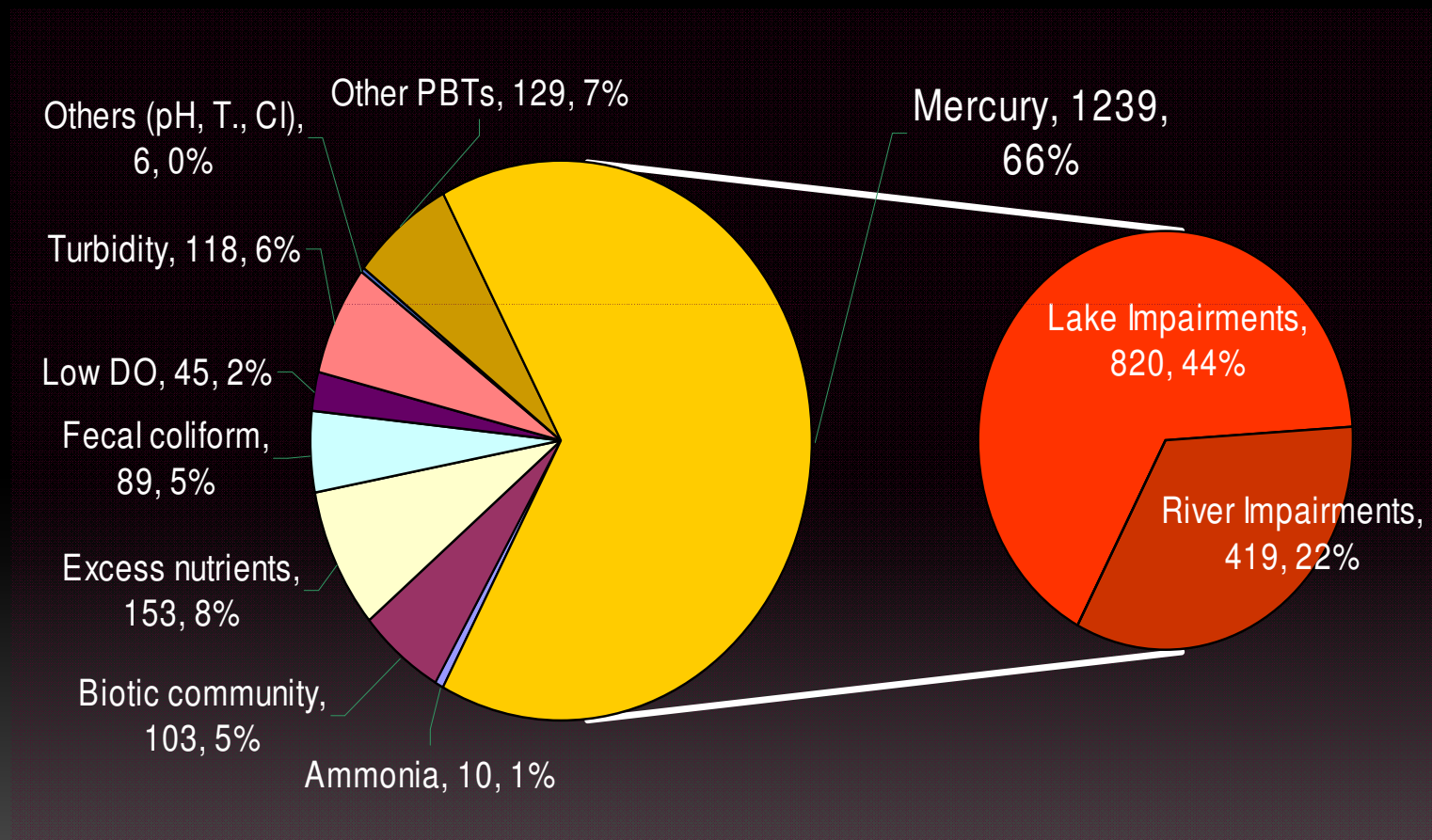
Mercury
Concentration
(mg/kg)



Methylmercury Criterion for Fish

- EPA MeHg Criterion, 0.3 ppm, uses fish consumption rate of 17.5 g/d
- MPCA MeHg Criterion, 0.2 ppm, uses 30 g/d
- The four FCA categories are unlimited, one meal/wk, one meal/month, not to be eaten
- Matches 1 meal/week threshold for sensitive population
- Mercury is not just a minor pollutant; it is a major health concern potentially causing serious neurological problems

Minnesota's Impaired Waters 2004



Summary of Monitoring Data Needed to Prepare the Statewide Mercury TMDL

- Fish tissue mercury data to show spatial differences and includes data from 1988–1992
- Sediment core data sufficient to est. whole basin mercury fluxes
- Wet deposition stations across the state to show uniform deposition
- Wastewater effluent data to estimate WLA

Total Mercury Deposition is Based on Sediment Cores

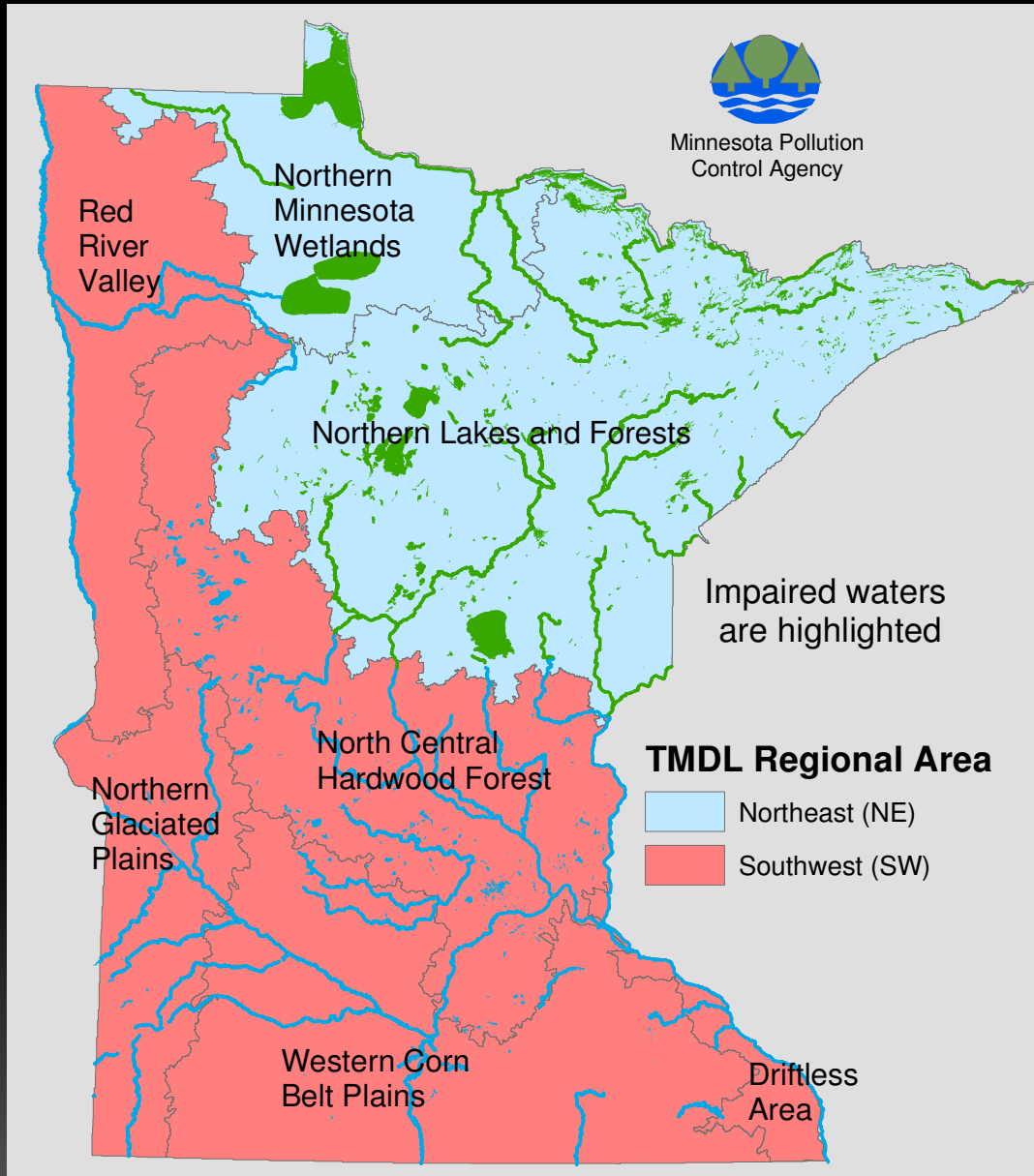


Engstrom and Swain
collecting a sediment core

Atmospheric Deposition: Sediment Core Findings

- ~70% current Hg deposition in MN from anthropogenic emissions (*30% global + 40% regional*)
- Annual atmospheric deposition ~ 12.5 $\mu\text{g}/\text{m}^2$
- Atm Dep peaked ~1970s in some parts of MN
- Deposition now relatively uniform across state; no known fish tissue hot spots

Minnesota Mercury TMDL Regions



TMDL
REGION

Dominant Mercury
Transport Process

Northeast
(NE)

Forest & wetland
hydrology

Southwest
(SW)

Erosion from
cultivated land

Estimated 1990 Mercury Loads by Region

TMDL Region	ATM DEP (kg/y)	WWTP (kg/y)	TOTAL (kg/y)	WWTP % of Total
NE	1,127	26	1,153	2.3%
SW	1,621	7	1,628	0.4%
Total	2,748	33	2,781	1.2%

Target Level & Reduction Factor

	NE	SW
Target fish mercury concentration	0.2 mg/kg	0.2 mg/kg
Mercury concentration for standard length walleye (WE40 ₉₀)	0.572 mg/kg	0.405 mg/kg
Reduction Factor (RF) = (WE40 ₉₀ – 0.2) ÷ WE40 ₉₀	65%	51%
Anthropogenic RF = (WE40 ₉₀ – 0.2) ÷ WE40 ₉₀ ÷ 70%	93%	73%

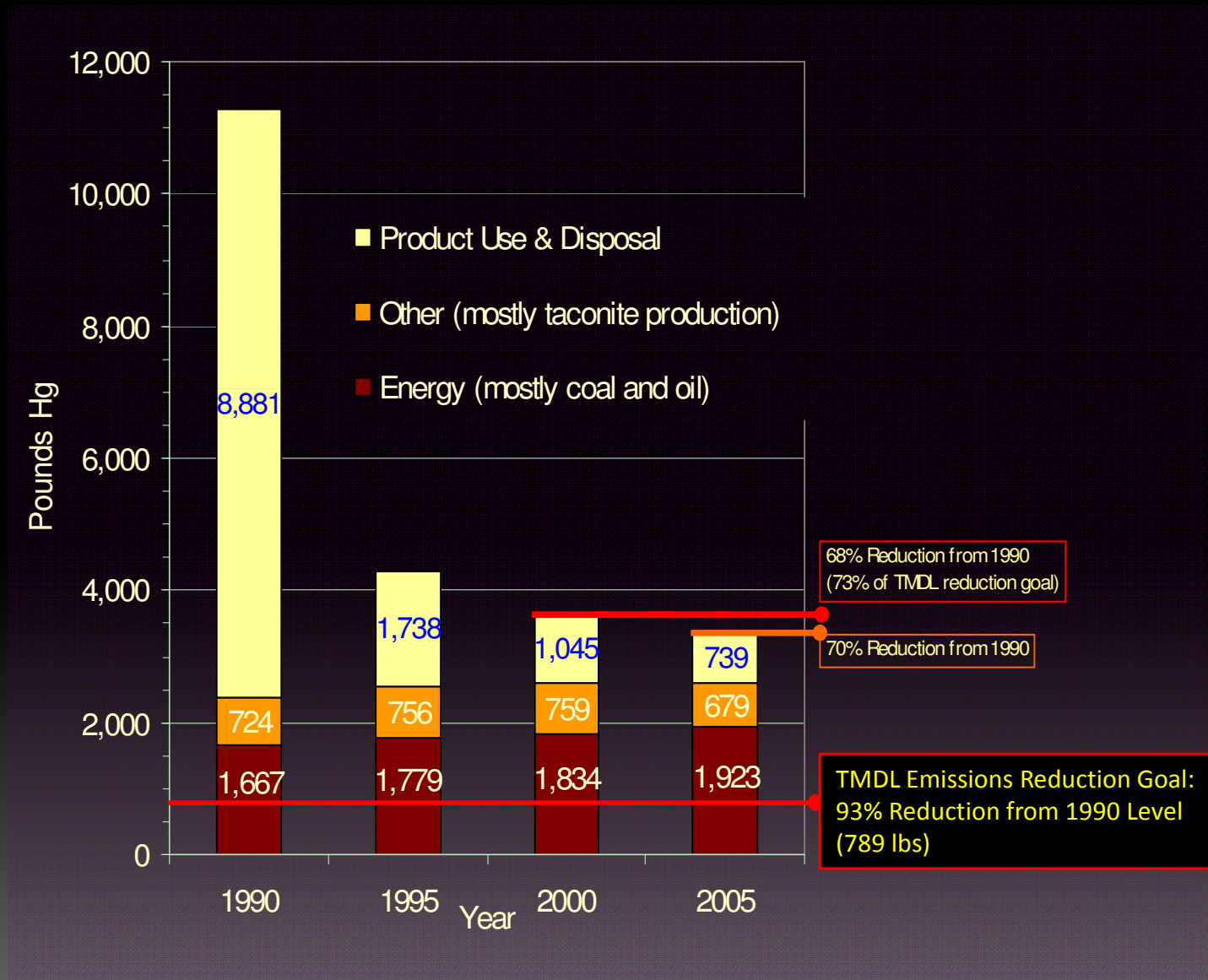
Water Point Sources of Mercury – Existing, Expanding, & New

- Data from about 37 facilities, averaged 5 ng/L Hg
- WLA not to exceed 1% of total mercury load allocation [*11 kg/yr*]
- In 1990, water point sources about 1.2% of total
- New & expanding water sources can expand up to the current WLA of 11 kg/yr
- Mercury minimization plan required

Point Source Load (Direct Surface Water Discharges)

- $PSL = \text{Design Flow} \times \text{Mercury (Hg) Concentration}$
- Hg average in wastewater based on 37 facilities (last five years): 5 ng/L
- Site-specific Hg conc for METRO & WLSSD
- Used sector-specific effluent concentrations for taconite, P&P, refinery, and electric power
- Cooling water not included, but other power plant discharges included

Minnesota Mercury Emissions, 1990, 1995, 2000 and Projected 2005



next

TMDL IMPLEMENTATION...